Firing area	Firing area
Servicing section	Servicing section
Handling and fueling	Handling and fueling

FOR ALL PROPELLANT UNLOADING OPERATIONS, INSURE THAT FIRE FIGHTING EQUIPMENT IS IN THE AREA WITH WATER UNDER PRESSURE FOR IMMEDIATE FLUSHING AND THAT APPROPRIATE PROTECTIVE CLOTHING IS WORN BY THE HAN-DLING CREW.

HYDROGEN PEROXIDE DRAINING

- 1. Insure that cap has been removed from overflow and vent line.
- 2. Emplace and secure propellant ladder.
- Position the H₂O₂ truck within 20 to 30 feet of the missile fill and drain fitting.
- 4. Electrically ground equipment and connect electrical power cable between AC distribution box and H2O2 electrical connector.
- 5. Connect suction hose from discharge side of H2O2 pump to suction fitting on top of H.O. drum.
- Connect discharge hose between suction intake of H₂O₂ pump and missile fill and drain fitting.
- INSURE THAT PUMP ROTATION IS IN THE DIRECTION OF THE ARROW ON PUMP HOUSING.
- Depress start pushbutton on pump motor.
- 8. Continue pumping operation until sight glass on suction side of pump indicates that flow of fluid has stopped.
- 9. Depress stop pushbutton on pump motor.
- IF MISSILE DISASSEMBLY IS TO FOLLOW DO NOT PERFORM STEPS 10 THROUGH 12. PROCEED WITH DEFUELING THEN GO TO TABLE XXI FOR FLUSHING PROCEDURES.
- 10. Disconnect discharge hose from missile and connect to coupling on drum vent fitting.
- 11. Disconnect power cable.
- 12. Replace protective caps on cables and hoses.

END OF HYDROGEN PEROXIDE DRAINING

	Servicing section	
	Handling and fueling	
_	Handling and fueling	

LOX DRAINING

- 1. Attach transfer hose between Y-connector and propellant ladder.
- 2. Connect LOX fill and drain valve to missile insuring that handwheel is fully counterclockwise.
- 3. Attach transfer hose between propellant ladder and fill and drain valve.
- 4. Position 2 LOX trailers as for filling the missile and connect transfer hose between each trailer and the Y-connector.
- INSURE THAT THE REGULATOR PRESSURE GAGE (VALVE BOX) REMAINS AT 750 PSI DURING DRAINING OPERATIONS. IF PRES-SURE DROPS, STOP DRAINING IMMEDIATELY UNTIL PRESSURE IS RESTORED. INSURE LOX VENT IS OPEN BY OBSERVING VAPOR DISCHARGE (VENT CONDUIT MUST BE REMOVED). INSURE THAT THE VALVE TEST SELECTOR SWITCH ON THE TEST CONTROL PANEL IN THE TEST STATION IS OFF THROUGH-OUT THE DRAINING OPERATIONS UNLESS OTHERWISE SPEC-IFIED IN THIS DRAINING PROCEDURE.
- DRAIN LOX BY GRAVITY ONLY.
- 5. Open valve No. 11 and insure valve No. 14 is open (both trailers).
- 6. Open LOX fill and drain valve on missile (screw handwheel clockwise until it
- 7. After missile is drained, close valve No. 11 (both trailers); open drain valve on Y-connector to drain transfer lines.
- 8. Disconnect all transfer lines and stow.
- 9. Leave fill and drain valve in open position and in the missile until the residual LOX (approximately 9 gallons) has boiled off.
- APPLYING HEAT THROUGH MISSILE ACCESS DOOR WILL SPEED UP THIS PROCEDURE. MISSILE MAY BE PLACED IN HORIZONTAL POSITION WITHOUT WAITING FOR COMPLETE BOIL OFF IF ALC AND H2O2 ARE NOT IN MISSILE.
- 10. When all LOX has boiled off, remove fill and drain valve unless ALC is to be drained later.

END OF LOX DRAINING

Firing area	Firing area
Service section	Servicing section
Handling and fueling	Handling and fueling

ALCOHOL DRAINING

- Connect ALC Fill and Drain Valve to missile insuring that handwheel is fully counterclockwise.
- Position ALC trailer near base of propellant loading ladder and electrically ground trailer.
- 3. Open manhole cover on ALC trailer.
- 4. Connect 25 foot transfer hose to ground half of ALC Fill and Drain Valve.
- 5. Insert other end of transfer hose thru manhole into ALC trailer.
- IF LOX HAS BEEN DRAINED, INSURE THAT LOX FILL AND DRAIN VALVE IS ATTACHED TO MISSILE AND HANDWHEEL IS FULLY CLOCKWISE. REMOVE PROTECTIVE CAP FROM GROUND HALF OF VALVE. INSURE THAT THE VALVE TEST SELECTOR SWITCH ON THE TEST CONTROL PANEL IN THE TEST STATION IS OFF AND REMAINS IN THAT POSITION THROUGHOUT THE DRAINING PROCEDURE.
- IF LOX HAS NOT BEEN DRAINED, MAKE SURE THAT THE REGULATOR PRESSURE GAGE READS 750 PSI ON THE VALVE BOX AT ALL TIMES DURING DRAINING OPERATIONS. MAKE SURE THAT VAPOR IS DISCHARGING FROM THE LOX VENT AT ALL TIMES DURING THE DRAINING OPERATIONS. IF EITHER OF THE ABOVE INDICATIONS ARE LOST, STOP DRAINING IMMEDIATELY AND DON'T RESUME UNTIL BOTH INDICATIONS ARE RECOVERED. INSURE THAT THE VALVE TEST SELECTOR SWITCH ON THE TEST CONTROL PANEL IN THE TEST STATION IS OFF AND REMAINS IN THAT POSITION THROUGHOUT THE DRAINING OPERATIONS UNLESS OTHERWISE SPECIFIED IN THE DRAINING PROCEDURES.
- 6. Slowly rotate handwheel on ALC Fill and Drain Valve clockwise.

OBSERVE THRU MANHOLE FOR STOPPAGE OF ALCOHOL FLOW.

7. Disconnect ground cable, transfer hose, and ALC Fill and Drain Valve.

DO NOT PROCEED TO STEP 8 IF THE ALCOHOL WAS DRAINED FOR REHEATING PURPOSES.

- Attach a hose to the quick disconnect fitting above the main alcohol valve and direct the remaining alcohol into a suitable container.
- Attach a hose to the quick disconnect fitting on the engine fuel pump volute housing and direct the remaining alcohol into a suitable container.
- 10. Vent and drain igniter ALC bottle.

END OF ALCOHOL DRAINING

INERT LEAD DRAINING

DURING THE DRAINING, FLUSH THE AREA WITH WATER.

- Remove one or both of the large engine chamber drain plugs and allow inert lead fluid to drain.
- Have propulsion panel operator open the main alcohol valve using the procedures employed in Inert Lead Start Loading, Table XIII, to finish draining procedure.
- AFTER COMPLETE PROPELLANT UNLOADING HAS BEEN ACCOMPLISHED, SMALL QUANTITIES OF DANGEROUS CHEMICALS MAY BE PRESENT. EXERCISE CAUTION.
- 3. Replace engine chamber drain plug and have main alcohol valve closed.
- IF MISSILE DISASSEMBLY IS TO FOLLOW, AND LITHIUM CHLORIDE WAS USED AS THE INERT LEAD START, GO TO TABLE XXI FOR FLUSHING PROCEDURES.

END OF TABLE XX

	1 anie XXI	
	Firing area	
Test station Servicin		cing section
Propulsion and electrical console	Electrical and pneumatic	Handling and fueling
H ₂ O ₂ FLUSHING	H ₂ O ₂ FLUSHING	H ₂ O ₂ FLUSHING
F LUSHING OPERATIONS MUST BE PERFORMED PRICE. MINERALIZED WATER ARE REQUIRED.	OR TO MISSILE DISASSEMBLY. IN ORDER TO PR	ERFORM H ₂ O ₂ FLUSHING THREE BARRELS OF DE-
		 Insure H₂O₂ overflow container is connected to the missile.
		 Connect H₂O₂ pump to a barrel of demineralized water and fill H₂O₂ tank.
		3. Drain H ₂ O ₂ tank back into barrel.
		4. Repeat steps 2 and 3 with two other barrels.
	5. Insure P-4017 is installed in missile.	 Disconnect fill hose from barrel and attach dummy fitting to insure that hose connection is open.
	6. Install engine pneumatic pressure regulator gage.	6. Place drain end of hose in a convenient location.
7. Insure operation selector switch is in test position (PP).	7. Set engine pneumatic pressure regulator to 100 psi.	
 Rotate valve test selector switch to the H₂O₂ PRESS position (PP). 		 Request propulsion console operator to energize H₂O₃ pressurizing valve.
 Depress test pushbutton and hold until notified to release (PP). 		 Monitor drain hose until visible vapors stop. Notify propulsion panel console operator to release test push- button.
10. Repeat step 9 on request.		10. Wait approximately 1 minute then repeat steps 8 and 9 in this column.
		 Repeat step 10 until such time as visible vapors cease to flow from drain hose.
		12. Disconnect drain hose from missile.
		13. Disconnect overflow hose from missile. Remove both caps from T connection.
14. Repeat step 9 on request.		 Request propulsion console operator to pressurize H₂O₂ tank to 100 psi.
		TANK IS PRESSURIZED WHEN AIR FLOW IS NO LONGER AUDIBLE.

Table XXI-Continued

	Firing area	
Test station	Servicing section	
Propulsion and electrical console	Electrical and pneumatic	Handling and fueling
H ₂ O ₂ FLUSHING—Continued	H ₂ O ₂ FLUSHING—Continued	H ₂ O ₂ FLUSHING—Continued
		15. Inform propulsion console operator to release test pushbutton. WHEN TEST PUSHBUTTON IS RELEASED, H ₂ O ₂ TANK WILL AUTOMATICALLY VENT THRU THE H ₂ O ₂ VENT AND OVERFLOW LINE. MONITOR THE VENTING ACTION FOR VAPORS.
		16. Repeat steps 14 and 15 until no vapors are observed.
17. Rotate valve test selector switch to Off (PP).	 Reset engine pneumatic pressure regulator to specified value for missile operation. 	17. Disconnect all H ₂ O ₂ Flushing equipment.
	 Remove engine pneumatic pressure regulator gage and P-4017 from missile. 	IF MISSILE DISASSEMBLY IS TO FOLLOW AND LITHIUM CHLORIDE WAS NOT USED, REMOVE ALL PROPELLANT LOADING EQUIPMENT.
END OF H ₂ O ₂ FLUSHING	END OF H ₂ O ₂ FLUSHING	END OF H ₂ O ₂ FLUSHING
LITHIUM CHLORIDE FLUSHING	LITHIUM CHLORIDE FLUSHING NOTE FLUSHING IS NECESSARY ONLY WHEN LITHIUM CHLORIDE WAS USED AS THE INERT LEAD START FLUID.	LITHIUM CHLORIDE FLUSHING 1. The following equipment is required for flushing procedures: a. Lithium chloride test apparatus. b. One 55-gallon drum of demineralized water. c. Hand pump.
		2. Rinse exterior of hand pump.
		3. Insert pump suction line into 55-gallon drum of water.
		 Connect inert fill hose to pump outlet and pump several gallons of water to remove lithium chloride residue.
		5. Connect inert lead fill hose to the connection on the main ALC valve.
6. Insure the operation selector switch is in test position (PP).		 Connect inert lead overflow hose to the connection above the main ALC valve, and place drain end in a convenient drainage location.
7. Rotate the valve test selector switch to Main ALC Valve position (PP).		7. Request propulsion console operator to energize the main ALC valve.

Firing area			
Test station	Service	Servicing section	
Propulsion and electrical console	Electrical and pneumatic	Handling and fueling	
LITHIUM CHLORIDE FLUSHING—Continued	LITHIUM CHLORIDE FLUSHING—Continued	LITHIUM CHLORIDE FLUSHING—Continued	
8. Depress test pushbutton and hold until notified to release (PP).		EXERCISE CAUTION IN PERFORMING STEP 9, AS PUMPING TOO RAPIDLY AFTER FLUID STARTS TO FLOW FROM OVERFLOW HOSE WILL CAUSE LIQUID LEVEL IN THE MANIFOLD TO RISE INTO AND THROUGH THE INJECTOR PLATE. 9. Operate hand pump until water overflows.	
		10. Remove drain plugs and allow water to drain.	
		11. Request propulsion console operator to close the main ALC valve.	
12. Release test pushbutton (PP).			
		13. Replace drain plugs.	
		14. Obtain test apparatus.	
		15. Prepare Standard solution and place in test rack. a. Using one (1) milliliter pipette, place one (1) milliliter of 0.1% Lithium Chloride solution in a Nessler tube. b. Use pipette to add approximately 50 milliliters of distilled water. c. Use a clean pipette to add three (3) milliliters of the Silver Nitrate solution. d. Add distilled water to 100 milliliter mark or Nessler tube. e. Remove Nessler tube from rack and mix contents of tube by shaking or swirling. f. Label tube to permit identification, and place back in rack. KEEP AMBER BOTTLE CONTAINING SILVER NITRATE CAPPED TO PREVENT DETERIO RATION BY SUNLIGHT. SINCE SILVER NITRATE IS SUNLIGHT SENSITIVE, IT IS RECOMMENDED THAT THE TEST BE PERFORMED INSIDE A VEHICLE TO PREVENT DISCOLORATION. IF, HOWEVER, THE TEST MUST BE	

Firing area		
Test station	Servi	cing section
Propulsion and electrical console	Electrical and pneumatic	Handling and fueling
LITHIUM CHLORIDE FLUSHING—Continued	LITHIUM CHLORIDE FLUSHING—Continued	CONDUCTED IN THE SUNLIGHT, INSURE THAT ALL CHEMICAL SOLUTIONS IN THE NESSLER TUBES ARE EQUALLY EXPOSED (AT LEAST 3 MINUTES). THE DISCOLORATION WILL THEN BE COMMON TO ALL SOLUTIONS, THEREBY MAINTAINING TEST ACCURACY.
 Repeat step 8 on request (PP). Release test pushbutton when notified by chief of servicing section (PP). 		 Repeat steps 7 through 13. Retain a sample of the flush water from the drain holes.
		 Prepare flush water sample and place in test rack. a. Using measuring pipette, place one (1) milliliter of flush water in clean Nessler tube. b. Use pipette to add approximately 50 milliliters of distilled water. c. Use a clean pipette to add three (3) milliliters of distilled water. d. Add distilled water to 100 milliliter mark on Nessler tube. e. Remove Nessler tube from rack and mix contents of tube by shaking or swirling. f. Label tube to permit identification and place in rack.
		18. Compare the Nessler tubes containing solutions for cloudiness. a. If the tube containing the flush water sample is equally, or less, cloudy than the tube containing the Standard solution, then the engine manifold is sufficiently flushed. b. If the sample is cloudier than the Standard, the Lithium Chloride concentration is still too great, and the engine manifold requires further flushing. THE CLOUDINESS OBSERVED IN STEP 18 WILL HAVE A PURPLE TINT IF THE SOLUTIONS HAVE BEEN EXPOSED TO SUNLIGHT; WHITE IF THEY HAVE NOT.
19. Repeat steps 8 and 12 as requested by chief of servicing section (PP).		 Repeat steps 7 thru 13 of this procedure until the indications of step 18 above are satisfied.

Table XXI—Continued

Firing area			
Test station	Serv	ricing section	
Propulsion and electrical console	Electrical and pneumatic	Handling and fueling	
LITHIUM CHLORIDE FLUSHING—Continued	LITHIUM CHLORIDE FLUSHING—Continued	LITHIUM CHLORIDE FLUSHING—Continued 20. After test is completed, discard solutions in the Nessler tubes, and rinse glassware several times with distilled water. OPEN AMMONIUM HYDROXIDE BOTTLE ONLY IN A WELL VENTILATED AREA. THE FUMES ARE EXTREMELY IRRITATING.	
		 Rinse Nessler tubes with Ammonium Hydroxide to remove Silver Chloride deposits; follow with distilled water rinse. 	
		22. Replace all items in the test kit.	
		23. Insure manifold drain plugs are replaced.	
		24. Remove inert lead start filling and overflow hose from fuel disconnects.	
END OF LITHIUM CHLORIDE FLUSHING	END OF LITHIUM CHLORIDE FLUSHING	END OF LITHIUM CHLORIDE FLUSHING	
THIS COMPLETES THE FLUSHING PROCED	URES REQUIRED OF ARTILLERY PERSONNEL.	THE MISSILE CAN NOW BE DISASSEMBLED.	
END OF TABLE XXI	END OF TABLE XXI	END OF TABLE XXI	

Table XXII

	Firing area	
Firing section	Servicing section	
	Electrical and pneumatic	Handling and fueling
MISSILE DISASSEMBLY	MISSILE DISASSEMBLY	MISSILE DISASSEMBLY
I. Insure that all switches in the TEST STATION are in the Off or Normal position.	 Before starting missile disassembly, insure that the missile is COMPLETELY vented of air and that the Drop Tank has been drained of LN₃. When the above items are completed, shut down the following electrical sources: Power Distribution Trailer. Insure that both energizer output switches are Off. Depress Off pushbuttons for both energizers. Insure that circuit breakers, CB-1, CB-2, CB-3, CB-4, CB-5, CB-6, and CB-7 are in the Off position. 60-KW Generator. Power down the generator according to instructions mounted on instrument panel door. 	1. Drain Drop tank. a. Reconnect LN ₂ Supply Trailer. b. Open LN ₃ Supply Tank vent valve. c. Open LN ₃ Supply valve on LN ₃ Supply tank. d. Turn Manual/Automatic switch to Manual Orposition. LN ₂ GRAVITY DRAINS FROM DROP TANK TO LN ₃ SUPPLY TANK. WHEN LN ₂ TANK IS APPROXIMATELY EMPTY TANK LOW LAMP WILL COME ON. e. Close supply valve on LN ₂ Supply tank when Droptank is empty. f. Vent supply hose by actuating pressure relief valve on LN ₂ outlet tee. VENT GAS SLOWLY TO PREVENT LN ₃ FROM SPRAYING OUT OF VENT EXHAUST PIPE
	2. Power down the Air Compressor.	2. Disconnect LN ₂ Trailer.
	3. Power down the Air Servicer.	 Insure propellant loading ladder and fueling hoses are removed from missile.
	4. Vent all sources of air and pneumatic lines.	

ALL AVAILABLE PERSONNEL ASSIST IN DISCONNECTING AND REMOVING ALL AIR LINES, ELECTRICAL CABLES, AND ON-LAUNCHER COMPONENTS.
THIS EQUIPMENT AND ALL OTHER ACCESSORY EQUIPMENT SHOULD BE STORED IN ITS PROPER POSITION ON THEIR CARRYING VEHICLES. RETURN THIS EQUIPMENT TO ITS ORIGINAL POSITION IN THE REVERSE ORDER OF ITS REMOVAL.

THE FOLLOWING STEPS ARE TO BE PERFORMED CONCURRENTLY WITH THE DISCONNECTION AND STORAGE OF THE GROUND ELECTRICAL AND PNEUMATIC COMPONENTS:

Remove the mainstage stick and bracket.	Insure that expulsion cylinders pressure line is com- pletely vented of air.	5. Refasten tail fin attaching collars.
3. Remove the igniter squib.		6. Remove the carbon jet vanes.
		7. Remove the rudders.
		8. Install lifting lugs at forward (nose) hoist point
		9. Connect erection cables to foward lifting lugs.

Table XXII—Continued

	Firing area	
Firing section	Servicing section	
Firing section	Electrical and pneumatic	Handling and fueling
MISSILE DISASSEMBLY—Continued	MISSILE DISASSEMBLY—Continued	MISSILE DISASSEMBLY—Continued
		10. Disengage rotating frame locks all the way.
		 Rotate the missile as required so that the lifting lugs are at right angles to the erector (as for erection).
		12. Lower H-frame and connect to launcher (as for erection).
		13. Assemble and fasten A-frame to launcher and install chain hoists.
		14. Install rotating frame open-eye pivots, and insert pins.
		15. Rig the erection cables to the A-frame equalizer pulley.
		16. Position the warhead trailer so that the warhead will rest on the trailer cradles.
		17. Take up slack in the erection cable.
		18. Use the hydraulic arresting unit to tilt the missile beyond the balance point (unwind the cable as required).
		19. Lower the missile, insuring that warhead trailer is in proper position, until the warhead is resting in the cradles and there is slack in the cables.
20. Remove drop tank.		20. Install remainder of lifting lugs.
21. Open the instrument compartment and skirt access doors.		21. Unfasten erection cable and connect thrust unit sling to the chain hoists and the lifting lugs on thrust unit.
22. Disconnect the electrical connections between the body and thrust unit.	22. Remove the batteries.	
23. Disconnect the electrical connections between the warhead and aft unit.	23. Disconnect the Mono coupling between the body and thrust unit.	
24. Remove the ST-80.		
25. Close and secure the instrument compartment and skirt access doors.		25. Remove pins from Open-Eye Pivots.

Table XXII—Continued

	Firing area	
Firing section	Servicing section	
	Electrical and pneumatic	Handling and fueling
MISSILE DISASSEMBLY—Continued	MISSILE DISASSEMBLY—Continued	MISSILE DISASSEMBLY—Continued 26. Using chain hoists, lift Thrust Unit until rotatin
		frame assembly is clear of pivots.
		 Drive the Warhead trailer forward approximately feet while lowering A-frame and raising chain hoists.
		28. Fasten Warhead to Warhead trailer.
		29. Loosen Explosive Bolts retaining screws.
		30. Remove Explosive bolts.
		31. Drive Warhead trailer out of the way.
		32. Using chain hoists, raise Thrust Unit several feet.
		33. Back the Thrust Unit Trailer under the suspended unit.
		34. Lower the Thrust Unit onto the trailer.
		35. Fasten the Thrust Unit to the trailer. MARK THE THRUST UNIT CONTAMINATED
		 Unfasten the lifting sling and attach the chain hoists to the rotating frame assembly.
		37. Unfasten the tail fin attaching collars.
		38. Lower and fasten the rotating frame assembly to the launcher; insuring the roller shims are installed.
		39. Drive the Thrust Unit trailer from the area.
8		40. Position the Warhead trailer under the A-frame. THE M-5 WRECKER ALTERNATE METHOD FOR DISASSEMBLY OF THE BODY UNIT MAY BE USED.
		41. Rig the aft unit for hoisting.
		42. Take up slack in the hoists.

Table XXII—Continued

Firing area		
Firing section	Servicing section	
	Electrical and pneumatic	Handling and fueling
MISSILE DISASSEMBLY—Continued	MISSILE DISASSEMBLY—Continued	MISSILE DISASSEMBLY—Continued 43. Open the connecting bolt access doors.
		44. Remove the connecting bolts.
		45. Drive the warhead trailer from the area.
		46. Back the aft unit trailer to the launcher.
		47. Fasten the aft unit to the trailer.
		48. Disconnect the hoists from the aft unit.
		49. Drive the aft unit trailer from the area.
		50. Disassemble the A- and H-frames.
		 Prepare launcher for towing and connect it to erectoruck.
		52. Drive the erector truck from the area.
	MARCH ORDER ALL EQUIPMENT	
END OF TABLE XXII	END OF TABLE XXII	END OF TABLE XXII

By Order of Wilber M. Brucker, Secretary of the Army:

G. H. DECKER,

General, United States Army,

Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

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